Description

Equipment for filling containers

Technical Field

The present invention relates to an item of equipment for filling containers.

In particular, the invention finds application in the art field concerned with the packaging of substances and/or products consisting in liquids, viscous fluids, creams, gels and/or powders.

Background Art

Generally speaking, the aforementioned substances are packaged utilizing dedicated equipment able to fill a succession of empty containers automatically. Such equipment typically comprises a carousel carrying a plurality of filler units, each presenting an outlet connected to a relative tank replenishable with a supply of the substance being packaged. The containers are conveyed by the carousel between an infeed station, where an empty container is placed on a supporting structure associated with each of the filler units, and an outfeed station where the container, filled with the substance being packaged, is taken up from the carousel and directed toward the next station of the packaging line. The tank in which the substance for packaging is held can be mounted on top of the carousel.

The prior art also embraces equipment by which individual containers can be filled with different substances. In this instance, each outlet can be connected selectively, by way of suitable valve elements, to different tanks associated with the equipment and containing different substances. Thus, the empty containers can be filled entirely with one of the substances being packaged, or with two or more such substances dispensed on the basis of higher specific weight.

Notwithstanding the advantage that equipment of the aforementioned type can be used to fill empty containers with at least two different substances, the applicant has found that there are also certain drawbacks, connected mainly with the reliability of the equipment, with the inconvenience of frequent maintenance operations made necessary by the use of common pipelines to dispense dissimilar substances, and with the quality of the end product.

In particular, it has been found that where common pipelines are used to deliver alternating flows of substances having dissimilar physical and/or chemical properties, for example viscosity and others, the internal condition of the pipelines must be inspected continually, and the bores cleaned repeatedly to avoid the risk that particles of a given substance will cling to the inside walls and be dispensed subsequently together with a different substance, causing the unwanted passage of these residual substances into the containers.

Clearly, repetitive maintenance signifies a slower operating tempo and consequently generates increased production costs.

The object of the present invention is to overcome the problems associated with the prior art by providing equipment for filling containers such as will be reliable, while allowing containers to be filled with substances having dissimilar properties.

A further object of the invention is to lower the maintenance requirement for such equipment and reduce the associated production costs.

Disclosure of the Invention

The stated objects and others besides are realized according to the present invention in equipment for filling containers, substantially as described in the following specification and recited in the appended claims.

The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

-figure 1 is a schematic plan view showing equipment for filling containers according to the present invention, illustrated in a first operating position;

-figure 2 is a schematic plan view showing the equipment of figure 1, illustrated in a second operating position;

-figure 3 is an elevation view showing a detail of the equipment as in figures 1 and 2, illustrated in a first embodiment;

-figure 4 is an elevation view showing a detail of the equipment, illustrated in a second embodiment;
-figure 5 is a further elevation view showing a detail of the equipment, illustrated in a third embodiment.

With reference to the accompanying drawings, the present invention relates to equipment for filling containers, denoted 1 in its entirety.

In particular, the equipment 1 is designed to fill a succession of empty containers 2 continuously and automatically. In the example illustrated, such containers 2 appear as bottles 3 of essentially cylindrical geometry, each disposed with its axis A in a substantially vertical position. The single bottle 3 terminates uppermost in a neck 4 affording a mouth 5 through which one or more substances (not illustrated) are directed into the selfsame bottle during the filling operation, and from which the contents will be poured ultimately by the consumer when in use. The substances can be of any given type suitable for packaging in containers 2, typically food or detergent products of liquid, viscous, cream or gel consistency, or granules and/or powders, such as can be batched into the container 2 without difficulty by gravity or pressure difference methods.

As illustrated in the accompanying drawings, the equipment 1 comprises a frame 6 and, associated with the frame, at least one carousel 7 of substantially cylindrical appearance. The carousel 7 is rotatable about a substantially vertical axis X, coinciding

with its own axis, and presents a plurality of filler units 8 spaced apart circumferentially along the periphery of the carousel 7 and angularly about the axis of rotation X.

Advantageously, each filler unit 8 comprises a first outlet 9 and a second outlet 10 connected respectively to a first tank 11 and a second tank 12 holding respective first and second packageable substances with dissimilar physical and/or chemical properties. It will be appreciated however, that the illustration of an example with two outlets 9 and 10, one serving to dispense a first substance and the other to dispense the second, implies no limitation in scope of the equipment according to the invention, which might be configured with three or even more outlets to each filler unit 8, each serving to dispense a relative substance.

Preferably, the first and second tanks 11 and 12 are associated with the top of the carousel 7, and more exactly, the tanks 11 and 12 are positioned internally of a hollow casing 7a carried by the selfsame carousel 7. The hollow casing 7a is equipped with a set of couplings 7b interposed between the tanks 11 and 12 and the respective outlets 9 and 10, by which the outlets are connected to the tanks.

Whilst the configuration and the structure of the tanks 11 and 12 naturally might be of any given type, the tanks 11 and 12 in the examples of the drawings are incorporated into the hollow casing 7a of the carousel 7 and delimited by relative partitioning

baffles. The tanks 11 and 12 might also be located externally of the carousel 7 and connected to the filler outlets 9 and 10 by way of suitable pipelines and valves.

Still with reference to the accompanying drawings, each filler unit 8 further comprises at least one supporting structure 13 such as will carry a respective container 2 to be filled with the first and second substances. In detail, each supporting structure 13 presents a first end 13a attached to the frame 6 of the equipment 1 and a second end 13b, opposite to the first, affording a substantially horizontal pedestal 14 on which to stand a respective container 2.

Advantageously, the equipment 1 also comprises motion-inducing means 15 associated with each filler unit 8, by which the relative supporting structure 13 can be shifted in relation to the respective first and second outlets 9 and 10 between a first filling position (figure 1), in which the relative first outlet 9 is placed above the mouth 5 of a respective container 2, and a second filling position (figure 2) in which the second outlet 10 is placed above the mouth of the container 2.

To further advantage, the motion-inducing means 15 of each filler unit 8 operate directly on the relative supporting structure 13 to bring about the movement between the first and the second position.

As illustrated in figures 1 and 2, the supporting structure 13 of each filler unit 8 engages pivotably

by way of the first end 13a with the carousel 7 of the equipment 1. Thus, each supporting structure 13 is free to swing on a pivot axis Y substantially parallel to the axis A of the single container 2. In particular, each supporting structure 13 is hinged to the carousel 7 at a point between the first and second outlets 9 and 10, with the corresponding pivot axis Y lying equidistant from the selfsame outlets 9 and 10 and occupying a position substantially mid-way between the axis of rotation X of the carousel 7 and the outlets 9 and 10.

In a first embodiment of the equipment shown in figure 3, the outlets 9 and 10 of each filler unit 8 are attached to the bottom of the hollow casing 7a, which projects radially from the carousel 7. More exactly, the outlets 9 and 10 extend substantially in a vertical direction from the hollow casing 7a toward the respective supporting structure 13 beneath and are connected to the corresponding tanks 11 and 12 each by way of a respective coupling 7b extending likewise substantially in a vertical direction.

In a second embodiment of the equipment illustrated in figure 4, the outlets 9 and 10 are similar in every respect to those of the first embodiment but connected to the corresponding tanks 11 and 12 by way of couplings 7b angled convergently away from the outlets and toward the axis of rotation X of the carousel 7.

In a third embodiment illustrated in figure 5, the tanks 11 and 12 are again incorporated into a hollow

casing 7a surmounting and projecting radially from the carousel 7. The outlets of this solution however, which present a substantially curvilinear outline when viewed in profile, are attached directly to and supported by the respective couplings 7b. The couplings 7b likewise present a substantially curvilinear profile and combine with the outlets 9 and 10 to create elements of reverse curve profile located externally of the hollow casing 7a.

Referring in particular to figures 1 and 2 of the accompanying drawings, the motion-inducing means 15 of each filler unit 8 comprise at least one fluid power actuator 16 interposed and operating between the respective supporting structure 13 and the carousel 7 carried by the frame 6. Each actuator 16 preferably comprises a cylindrical housing 18 anchored to the carousel 7, and a movable rod 19 engaging slidably with the cylindrical housing 18. The end of the rod 19 opposite to the end associated with the cylindrical housing 18 is attached to the relative supporting structure 13.

The rod 19 of each fluid power actuator 16 is able to stroke between a retracted position (figures 1, 3…5), in which the greater part of its length lies internally of the respective housing 18, and an extended position (figure 2) in which the greater part of its length lies externally of the housing.

The movement of the rod 19 between the retracted and extended positions has the effect of shifting the supporting structure 13 between the first filling

position and the second filling position. When the rod 19 is in the retracted position, the relative supporting structure 13 occupies the first filling position, and conversely, when the rod 19 is in the extended position, the supporting structure 13 occupies the second filling position.

Each fluid power actuator 16 is also allowed a limited freedom of movement within a respective horizontal plane, in such a way that it can adapt to the movements of the relative supporting structure 13 and the associated parts. The movement in question is enabled by the manner in which the actuator 16 is attached to the carousel 7 and to the relative supporting structure 13. In particular, and as illustrated in the accompanying drawings, the cylindrical housing 18 of each actuator 16 is anchored pivotably to a mounting flange 20 of the carousel 7 by way of at least one hinge 18a. Similarly, the rod 19 is anchored pivotably, by way of at least one hinge 19a, to a substantially triangular linkage flange 13c of the respective supporting structure 13, so that a movement of the rod 19 between the retracted position and the extended position will produce a partial rotation of the fluid power actuator 16 about the axis of the hinge 18a by way of which the housing 18 is connected to the carousel 7.

As discernible from the drawings, each mounting flange 20 projects radially from the carousel 7, whereas the linkage flange 13c extends from the

supporting structure 13 essentially at right angles, relative to the longitudinal dimension of the selfsame structure.

Each filler unit 8 is equipped also with sensing means 21 such as will measure the level of the substance in the respective container 2 and allow and/or disallow the flow of the first or the second substance through the relative outlet, according to the quantity of the substances in the container 2.

Preferably, the sensing means 21 of each filler unit 8 comprise at least one weighing device 22 associated actively with the respective supporting structure 13 and serving to detect the variations in weight of a container 2 during the filling step. As discernible from figures 3, 4 and 5, each of the weighing devices 22 comprises a weighing platform 23 coinciding with the aforementioned pedestal 14, and a weight-sensitive mechanism (not shown) connected to the platform 23.

As illustrated in the drawings, each filler unit 8 further comprises suitable clamp means 24 such as will restrain the respective container 2 on the relative supporting structure 13 and hold it in a stable position throughout the filling operation. To advantage, the clamp means are anchored to the weighing platform 23 in such a manner as to move as one with the pedestal, accompanying the vertical displacement occasioned by the variation in weight of the respective container 2.

Moreover, to ensure ease and convenience of the

usual maintenance operations carried out on the weighing devices 22, the clamp means 24 and the motion-inducing means 15, and on the dispensing outlets 9 and 10, each supporting structure 13 will incorporate suitable coupling means (not illustrated) by way of which it is associated removably with the carousel 7, and thus detachable.

In addition, the equipment 1 comprises electronic control means (not illustrated) connected to the level sensing means 21, by which the operation of filling the containers 2 is monitored and governed. The electronic control means in question, consisting preferably in a programmable device such as a personal computer or other similar electronic data processing system, will also comprise an actuating unit (not illustrated) associated with the motion-inducing means 15 and serving to set the respective supporting structures 13 in motion between the first and second filling positions, in response to the detection of significant data reflecting the quantity of the substances introduced into the respective container.

The operation of the equipment, described thus far essentially in structural terms, is as follows.

Before the cycle of filling the containers 2 is set in motion, the electronic control means are programmed in such a way as to respond to at least three significant parameters, of which a first is linked to the weight of the empty container 2, that is to say the tare, which can vary marginally from

one container to another. Preferably, therefore, the weight of each empty container 2 will be sensed and recorded at the moment when the container is placed on the platform 23 of the weighing device 22. A second parameter is the maximum quantity, expressed by weight, of the first substance dispensed. A third is the maximum quantity, expressed by weight, of the second substance dispensed.

During operation, the containers 2 are directed onto the respective supporting structures 13 singly and in succession. Each container 2 is positioned on the weighing platform 23 of the respective weighing device 22, and secured in place with the relative clamp means 24. The first outlets 9 are enabled to dispense a first substance into the containers 2, to the point at which the weight reaches a predetermined limit corresponding to a maximum level of the first substance being dispensed. Once the maximum weight for the first substance has registered, the electronic control means will inhibit the relative dispensing means, shutting off the flow to the outlet and causing the supporting structure 13 to shift from the first filling position to the second filling position by causing the rod 19 of the motion-inducing means 15 to move from the retracted position to the extended position. At this juncture, the electronic control means open the second outlets 10, which will proceed to introduce the second substance into the respective containers 2 until such time as a further maximum value is detected, whereupon the flow to the

second outlets 10 will be shut off. Thereafter, the containers 2 are directed away from the carousel and toward a further processing station.

The problems encountered with the prior art are overcome by the present invention, and the stated objects thus realized.

Firstly, the equipment according to the present invention is able to fill containers selectively with at least two different packageable substances, while ensuring faultless placement of the substances inside the containers as required to obtain a pleasing appearance.

Moreover, the design of the equipment disclosed notably reduces the usual maintenance operations rendered necessary by the continuously alternating passage of different substances through common pipelines. A reduced maintenance requirement helps in turn to speed up the production cycle, while lowering the costs involved in manufacturing and marketing the packaged products.